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EXAMINER	
THAKUR, VIREN A	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/500,448	Applicant(s) WAKAMURA, MASATO
	Examiner Viren Thakur	Art Unit 1761

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-14 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-14 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date 6/30/04.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. **Claims 1-10 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.**

Instant claims 1, 4, 7, and 10 recite the limitation "at least temporarily" in. The claims are unclear as to how much time can be considered at least temporary when placing the container in a dark place. The claims further recite the limitation "a dark place." The claims are not clear with regards to what can be considered a dark place. Instant claims 1, 4, 7 and 10 further recite the limitation "including metal atoms partially comprising photocatalytic metal." It is not clear as to how a metal atom can be partially photocatalytic.

Instant claims 2, 5, 8 and 11 recite the limitation "replacing part of Ca contained in calcium hydroxyapatite with Ti." It is unclear as to how only part of Ca (or calcium) can be replaced within the hydroxyapatite. Either the calcium is replaced in the hydroxyapatite molecule or it is retained within the molecule.

Instant claim 4 recites the limitation "wrapping food." The claim is unclear as to whether the step of wrapping food requires the metal-modified apatite.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. **Claims 1-2, 4-5, 7-8 and 13-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dunn (US 5658530) in view of Wakamura et al. (JP 2000-327315) and Sakurada et al. (US 6004667).**

Dunn teaches methods for deactivating biological contaminants and chemical contaminants on the surface of a perishable food product or on the packaging material by passing light through the package (Column 2, Lines 49-61; Column 3, Lines 34-41). Thus, Dunn teaches applying the anti-microbial composition to the food itself or to the packaging containing the food. The surface of the packaging material or food product is supplemented with titanium dioxide, which when illuminated at specific light frequencies will deactivate contaminants within the package or on the surface of the food product (Column 3, Lines 14-23; Column 4, Lines 59-62). Dunn further teaches the inner surface of the container comprising the titanium dioxide (Column 11, Line 58 to Column 12, Line 30). Dunn teaches applying a photocatalytic material to food containers or directly to foods.

Dunn is silent in teaching a metal-modified apatite, as recited in instant claims 1, 4 and 7 and placing the container in a dark place, at least temporarily. Regarding instant claim 4, Dunn is silent in teaching wherein the method for preserving food comprises wrapping food or a container containing food with a food wrapping film having a surface coated with a metal-modified apatite. Dunn is further silent in teaching wherein the metal modified apatite has a chemical structure obtained by replacing part of Ca contained in the calcium hydroxyapatite with Ti, as recited in instant claims 2, 5 and 8. Regarding instant claims 13 and 14, Dunn is silent in teaching wherein the food container has a material to when metal-modified apatite is added.

Wakamura et al. teach that titanium oxide has been well known to be an antimicrobial agent (Paragraph 0002). Wakamura et al. further teach that titanium oxide does not have the properties for adsorbing matter, such as microorganisms on its face and limited oxidative degradation of such microorganisms is achieved using titanium oxide, alone (Paragraph 0002). Wakamura et al. teach that titanium oxide films have limited oxidative degradation function when used on its own and calcium phosphate compounds such as hydroxyapatite tends to lose its

adsorption power when adsorption equilibrium is reached (Paragraph 0006). The invention of Wakamura et al. teach a combination of the photocatalyst activity of titanium with the adsorption activity of hydroxyapatite that maintains the adsorption power of the calcium phosphate while maintaining the oxidative disassembling properties of the photocatalyst (Paragraph 0002; Paragraph 0006; Paragraph 0007). Wakamura et al. further teach that calcium hydroxyapatite has been well known to adsorb organic substances (Paragraph 0003). To the ordinarily skilled artisan, it would have been obvious that as result of the adsorption properties hydroxyapatite would have enabled the removal of microbes from the surface of a material. By coprecipitation of the metallic oxide with the hydroxyapatite, Wakamura et al. teach replacing part of Ca with Ti (Paragraph 0010 and Example). Wakamura et al. further teach wherein the metal modified hydroxyapatite can be applied to several "configurations" such as a sheet, a film, a plate, a particle and a tablet (Paragraph 0017). Wakamura et al. teach that the sheet or film can be used to cover one or both sides of a base material (Paragraph 0017).

Sakurada et al. is relied on to teach that it has been well known to combine hydroxyapatite with a metal such as titanium for the purpose of providing an antimicrobial food packaging film (Column 5, Lines 18-22; Column 6, Lines 10-14 and 55-63; Column 9, Lines 19-26; Column 10, Lines 49-65).

In summary, Wakamura et al. teach that the modified hydroxyapatite can be shaped into several configurations and can be applied as a coating to a base material. Wakamura et al. teach that the titanium oxide provides oxidative degradation properties as well as antimicrobial and germicidal properties. Dunn similarly teaches using titanium oxide for its photocatalytic antimicrobial properties for foodstuffs and food containers. Sakurada et al. similarly teach that the coating combination of titanium oxide and hydroxyapatite can also be used in food packaging containers and wrappers; thus teaching multiple uses for the combination and further teaching that hydroxyapatite has been well known to remove microbes from food products. Given these teachings, it would have been obvious to one having ordinary skill in the art to coat a food container of Dunn using a metal-modified apatite, as taught by Wakamura et al. for the purpose of providing the oxidation disassembly properties of a photocatalyst such as titanium with the adsorptive properties of the calcium hydroxyapatite. Wakamura et al. teach that titanium oxide films have limited oxidative degradation function when used on its own and calcium phosphate tends to lose its adsorption power when adsorption equilibrium is reached (Paragraph 0006). This suggests to the ordinarily skilled artisan that the ability of the titanium of Dunn to fully prevent microbial growth would not have been efficient. Therefore the modification of using hydroxyapatite modified with titanium would have resulted in improved oxidation disassembly and absorption power of the hydroxyapatite and as a result, the anti-microbial properties of the container of Dunn would have been further improved.

Regarding instant claim 4, Dunn teach food containers and placing foods into food containers and Wakamura et al. teach wherein the metal modified apatite can be in the form of a sheet or film that can be applied to both surfaces of a base (Paragraph 0017), and wherein the base can take the shape of a sheet or a film (Paragraph 0017). Sakurada et al. teach that the combination of hydroxyapatite and titanium can be used as food wrappers (Column 10, Lines 62-65), which can be considered similar to the flexible films and sheets of Wakamura et al. Given these teachings and since Dunn teach food packaging, it would have been obvious to have applied the metal containing hydroxyapatite of modified Dunn to food wrappers, since wrappers have been well known to be used for packaging food products and Dunn teach preventing spoilage at the surface of the food or the food package.

Regarding placing the food container in a dark place, although silent in teaching this limitation, it would have been obvious that the foods taught by Dunn, such as a yogurt cup and packaged vegetables and meats would have been placed in a dark place. Additionally, Dunn further teaches refrigerated storage of food products (Column 1, Lines 22-28). It would have been obvious to the ordinarily skilled artisan that a refrigerator is a dark place. Therefore, to place the food container into a dark place would not have provided a patentable feature over the prior art.

Regarding instant claim 13, modified Dunn teach food containers wherein the inner surface is coated with hydroxyapatite modified with a photocatalytic metal. Regarding instant claim 14, the food container is made from a specific material, to which a combination of metal and hydroxyapatite is added. Therefore, modified Dunn teach a food container made of a material to which a metal-modified apatite is added.

6. **Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dunn (US 5658530) in view of Wakamura et al. (JP 2000-327315) and Sakurada et al. (US 6004667) as applied to claims 1-2, 4-5, 7-8 and 13-14, above, and in further view of Okamoto (JP 2000-051041).**

Dunn, Wakamura et al. and Sakurada et al. are taken as applied above. Dunn is silent in teaching wherein the surface of tableware is coated with a metal-modified apatite, as recited in instant claim 10.

Okamoto teaches tableware, such as a drinking cup that comprises a photocatalyst for the purpose of removing odor and dirt from the inner portions of the tableware. Thus, Okamoto teaches providing similar photocatalytic activity to the surfaces of tableware for the purpose of preventing dirt and odors that collect on the inner surface from affecting the taste of the food.

Given these teachings, it would have been obvious to one having ordinary skill in the art to apply the coating of modified Dunn to other items such as tableware. Since the coating of

modified Dunn can be applied as a wrapper or as a coating on a container and can further be applied to medical tools, cans, and bandages, to name a few (See Sakurada et al. Column 10, Lines 49-65), one would have had a reasonable expectation of success in applying the coating to cups and forks as spoons, for example. Such a modification, as taught by Okomoto, would have prevented dirt and odor from imparting an undesirable taste to the food product.

7. **Claims 3, 6 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dunn (US 5658530) in view of Wakamura et al. (JP 2000-327315) and Sakurada et al. (US 6004667) as applied to claims 1-2, 4-5, 7-8 and 13-14, above, and in further view of Shimamune et al. (US 4882196).**

Dunn, Wakamura et al. and Sakurada et al. are taken as applied above. Wakamura et al. further teach heat treating at about 500°C, after co-precipitation for the purpose of forming the crystallized structure of the titanium oxide for the purpose of exhibiting the photocatalytic activity (Paragraph 0017).

Dunn is silent in teaching wherein the metal-modified apatite after production has undergone sintering at 580 to 660°C.

Shimamune et al. teach a coating comprising hydroxyapatite and a metal, such as titanium (Column 2, Lines 37-40; Column 3, Lines 38-59). Shimamune et al. teach a calcium phosphate compound solution that further comprises hydrochloric or nitric acid and can further contain a metal such as titanium salts. As a result, the titanium alloy is also partly dissolved when in solution (Column 3, Line 60 to Column 4, Line 5). By teaching calcium phosphate compounds, Shimamune et al. teach that the calcium phosphate compound can be calcium hydroxyapatite (Column 3, Lines 5-9). In solution with the calcium phosphate compound, it would have been obvious to one having ordinary skill in the art as a result that during precipitation there would have been an exchange of some of the calcium of the hydroxyapatite with the titanium. Shimamune et al teach that the titanium in the base layer facilitates bonding to the titanium alloy of the substrate (Column 4, Lines 20-24). The calcium hydrogen phosphate used in the covering layer can be the same as that of the base layer (Column 4, Lines 34-37); therefore, the covering layer can also have the calcium hydrogen phosphate with bonded titanium. To laminate the coating, Shimamune et al. teach sintering the covering layer, (which can be the same as the base layer) and the base layer (Column 4, Lines 62-64), at a temperature from between 300 to 900°C. The actual temperature depends on the thickness and state of the calcium phosphate compound (Column 4, Lines 41-53). Shimamune et al. further teach that the result of sintering, and thus laminating is to "provide a titanium composite material having high affinity for the substrate and sufficiently high strength" (Column 4, Line 65 to Column 5, Line 15).

Wakamura et al. teach heating at about 500°C while Shimamune et al. teach that the temperature can be varied depending on the thickness of the calcium phosphate compound. Therefore, depending on the thickness of the coating applied by Wakamura et al., it would have been obvious to one having ordinary skill in the art to raise the sintering temperature for the purpose of ensuring the strength of lamination. Furthermore, in applying such a film to the food package of Dunn, it would have been obvious to ensure that the anti-microbial film has high strength and affinity to the substrate to which it was applied. Additionally, applying a thicker coating of the film of Wakamura et al. to the substrate of Dunn would have required higher sintering temperatures and thus, to sinter between 580 to 660°C would not have provided a patentable feature over the prior art.

8. **Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dunn (US 5658530) in view of Wakamura et al. (JP 2000-327315), Sakurada et al. (US 6004667) and Okamoto (JP 2000-051041) as applied to claims 10 and 11, above, and in further view of Shimamune et al. (US 4882196).**

Dunn, Wakamura et al. Sakurada et al. (US 6004667) and Okamoto, are taken as applied above. Wakamura et al. further teach after coprecipitation heat-treating at about 500°C for the purpose of forming the crystallized structure of the titanium oxide for the purpose of exhibiting the photocatalytic activity (Paragraph 0017).

Dunn is silent in teaching wherein the metal-modified apatite after production has undergone sintering at 580 to 660°C.

Shimamune et al. teach a coating comprising hydroxyapatite and a metal, such as titanium (Column 2, Lines 37-40; Column 3, Lines 38-59). Shimamune et al. teach a calcium phosphate compound solution that further comprises hydrochloric or nitric acid can further contain a metal such as titanium salts. As a result, the titanium alloy is also partly dissolved when in solution (Column 3, Line 60 to Column 4, Line 5). By teaching calcium phosphate compounds, Shimamune et al. teach that the calcium phosphate compound can be calcium hydroxyapatite (Column 3, Lines 5-9). In solution with the calcium phosphate compound, it would have been obvious to one having ordinary skill in the art as a result that during precipitation there would have been an exchange of some of the calcium of the hydroxyapatite with the titanium. Shimamune et al teach that the titanium in the base layer facilitates bonding to the titanium alloy of the substrate (Column 4, Lines 20-24). The calcium hydrogen phosphate used in the covering layer can be the same as that of the base layer (Column 4, Lines 34-37); therefore, the covering layer can also have the calcium hydrogen phosphate with bonded titanium. To laminate the coating, Shimamune et al. teach sintering the covering layer, (which can be the same as the base layer)

and the base layer (Column 4, Lines 62-64), at a temperature from between 300 to 900°C. The actual temperature depends on the thickness and state of the calcium phosphate compound (Column 4, Lines 41-53). Shimamune et al. further teach that the result of sintering, and thus laminating is to "provide a titanium composite material having high affinity for the substrate and sufficiently high strength" (Column 4, Line 65 to Column 5, Line 15).

Wakamura et al. teach heating at about 500°C while Shimamune et al. teach that the temperature can be varied depending on the thickness of the calcium phosphate compound. Therefore, depending on the thickness of the coating applied by Wakamura et al., it would have been obvious to one having ordinary skill in the art to raise the sintering temperature for the purpose of ensuring the strength of lamination. Furthermore, in applying such a film to the food package of Dunn, it would have been obvious to ensure that the anti-microbial film has high strength and affinity to the substrate to which it was applied. Additionally, applying a thicker coating of the film of Wakamura et al. to the substrate of Dunn would have required higher sintering temperatures and thus, to sinter between 580 to 660°C would not have provided a patentable feature over the prior art.

9. **Claims 1-2, 4-5, 7-8 and 13-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dunn (US 5658530) in view of Mawatari et al. (US 5614568) and Bontinck et al. (US 4367312).**

Dunn teaches methods for deactivating biological contaminants and chemical contaminants on the surface of a perishable food product or on the packaging material by passing light through the package (Column 2, Lines 49-61; Column 3, Lines 34-41). Thus, Dunn teaches applying the anti-microbial composition to the food itself or to the packaging containing the food. The surface of the packaging material or food product is supplemented with titanium dioxide, which when illuminated at specific light frequencies will deactivate contaminants within the package or on the surface of the food product (Column 3, Lines 14-23; Column 4, Lines 59-62). Dunn further teaches the inner surface of the container comprising the titanium dioxide (Column 11, Line 58 to Column 12, Line 30).

Dunn is silent in teaching wherein the food container is made from a metal modified apatite, as recited in instant claims 1, 4 and 7; and wherein the metal modified apatite has a chemical structure obtained by replacing part of Ca contained in calcium hydroxyapatite with Ti, as recited in instant claims 2, 5 and 8. Further regarding instant claims 4-5, Dunn is silent in teaching wrapping food or a container containing food with a wrapping film. Regarding instant claim 10, Dunn is silent in teaching tableware. Dunn is further silent in teaching wherein the container is placed in a dark place at least temporarily. Regarding instant claims 13 and 14,

Dunn is silent in teaching wherein the food container has a material to which metal-modified apatite is added.

Mawatari et al. teach antibacterial resin compositions which are applied to the surface of molded articles and can be used in many fields (Column 1, Lines 34-37). Mawatari et al. further teach that the styrene resin to which the antibacterial resin composition is applied has been used in kitchenware applications (Column 1, Line 17). To the ordinarily skilled artisan, kitchenware includes containers that hold food items. Mawatari et al. further disclose wherein an anti-bacterial metal such as iron or silver (Column 5, Lines 3-6) is bonded to a porous substrate such as hydroxyapatite (Column 7, Lines 22-49). Mawatari et al. further teach wherein by supporting the metal ions on the porous substance, the porous structured substance have been subjected to ion-exchange with the metal ions (Column 4, Line 62 to Column 5, Line 2). Thus, the metal ion would have replaced the ionic calcium in the hydroxyapatite, as recited in instant claims 2, 8 and 11. As a result, the metal supported on the substrate would not be dissolved out by water treatment (Column 7, Lines 43-47) and thus can be applied to the molded article such as the polymeric resin at any amount (Column 7, Lines 47-49). By being able to apply the combination of the hydroxyapatite with the metal ions in any amount, Mawatari et al. solves the problem of providing satisfactory antibacterial activity to styrene resins that was not available in previous methods.

Bontinck et al. teach styrene resins (See Abstract) for protecting foodstuffs, pharmaceuticals, cosmetics, toys, tools and similar articles, such as surgical instruments (Column 1, Lines 13-17). Bontinck et al. further teach packages of food products such as biscuits using the packaging film (Column 13, Lines 34-43).

In summary, Dunn teach containers for food products and desires deactivation of contaminants that grow on the surface of the food product or the food product container. To the ordinarily skilled artisan, it would have been well known that styrene resins have been commonly used in food packaging applications. Bontinck et al. is cited as further evidence of styrene resin films used for food wrapping applications. Mawatari et al. teach improving the antibacterial activity for styrene resin molded articles using a metal ion and hydroxyapatite. An ion-exchange occurs between the hydroxyapatite and the metal ion to secure the ion to the surface, thus allowing any amount of the antibacterial material to be applied to the surface of the molded article. Given these teachings it would have been obvious to one having ordinary skill in the art to bond the titanium of Dunn to the hydroxyapatite, as taught by Mawatari et al., for the purpose of increasing the antibacterial activity to styrene resin containers, which have been well known to be used for packaging food products. As a result of bonding the metal ions to the hydroxyapatite, as taught by Mawatari et al., it would have been obvious to one having ordinary skill in the art that the titanium of Dunn would have replaced the calcium of the hydroxyapatite in an ion-exchange. Such a modification would have increased the amount of the antibacterial metal applied to the

containers of Dunn, thus further improving the antibacterial ability of the food package. Additionally, as taught by Mawatari et al., water-treatment tends to dissolve out the metal ions from the hydroxyapatite and food product have been well known to undergo water treatment such as for steam sterilization which can affect the amount of the metal ions on the surface of the food product. By bonding the metal to hydroxyapatite, dissolution of the metal would have been prevented and thus the ability of the food products to be protected against antimicrobials would have been improved.

Therefore, regarding a wrapping having metal modified apatite, Bontinck et al. teach protecting foodstuffs that are wrapped in a styrene resin. Mawatari et al. teach providing antibacterial properties to styrene resins. Similar to Dunn, Bontinck et al. also teach protecting food using but instead of using a container Bontinck et al. packaging films. Nevertheless, since these films are also made of styrene resins it would have been obvious to one having ordinary skill in the art to apply the titanium bonded with the hydroxyapatite, as taught by modified Dunn for the purpose of preventing contamination of the foodstuffs and the pharmaceuticals that have been wrapped in the film. Such a modification would have ensured that the pharmaceutical and food products remain fresh and free of bacteria.

Regarding placing the food container in a dark place, although silent in teaching this limitation, it would have been obvious that the foods taught by Dunn, such as a yogurt cup and packaged vegetables and meats would have been placed in a dark place. Additionally, Dunn further teaches refrigerated storage of food products (Column 1, Lines 22-28). It would have been obvious to the ordinarily skilled artisan that a refrigerator is a dark place. Additionally, products as taught by Bontinck et al., such as pharmaceuticals and wrapped foods such as biscuits have been well known to the ordinarily skilled artisan to be stored in cabinets or areas of "darkness." Upon consumption the pharmaceutical product or the foodstuff would have been removed from the dark place to be consumed. Therefore, to place the food container into a dark place would not have provided a patentable feature over the prior art.

Regarding instant claim 13, modified Dunn teaches food containers wherein the inner surface is coated with hydroxyapatite comprising photocatalytic metal. Regarding instant claim 14, the food container is made from a material, to which a combination of metal and hydroxyapatite is added. Therefore, modified Dunn teach a food container made of a material to which a metal-modified apatite is added.

10. Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being anticipated by Dunn (US 5658530) in view of Mawatari et al. (US 5614568) and Bontinck et al. (US 4367312) as

applied to claims 1-2, 4-5, 7-8 and 13-14 above, and in further view of Okamoto (JP 2000-051041).

Dunn, Mawatari et al. and Bontinck et al. are taken as applied above in paragraph 9. Dunn is silent in teaching tableware and placing the tableware in a dark place at least temporarily.

Mawatari et al. teach applying a coating of metal bonded to hydroxyapatite to styrene resin molded articles, such as kitchenware (Column 1, Line 17).

Okamoto teaches tableware, which is similar to kitchenware, such as a drinking cup that comprises a photocatalyst for the purpose of removing odor and dirt from the inner portions of the tableware. Thus, Okamoto teaches providing similar photocatalytic activity to the surfaces of tableware for the purpose of preventing dirt and odors that collect on the inner surface from affecting the taste of the food.

Given these teachings, it would have been obvious to one having ordinary skill in the art to apply the coating of modified Dunn to other items such as tableware. Since the coating of modified Dunn can be as a coating on a container and can further be applied to a wide range of molded articles, one would have had a reasonable expectation of success in applying the coating of modified Dunn to cups and forks as spoons, for example. Such a modification, as taught by Okomoto, would have prevented dirt and odor within the drinking cup from imparting an undesirable taste to the food product.

Regarding placing the tableware in a dark place, although silent in teaching this limitation, it would have been obvious that the tableware such as cups and forks and spoons have been well known to be placed in cabinets and drawers which do not allow light. When used the tableware is removed from the storage cabinet or drawer and exposed to light. Therefore, to place the tableware into a dark place would not have provided a patentable feature over the prior art.

11. **Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bontinck et al. (US 4367312).**

Bontinck et al. teach wrapping food such as biscuits (Column 13, Lines 34-43) but is silent in teaching wherein the food product is placed in a dark place at least temporarily. However products such as pharmaceuticals and wrapped foods such as biscuits have been well known to the ordinarily skilled artisan to be stored in cabinets or areas of "darkness." Upon consumption the pharmaceutical product or the foodstuff would have been removed from the dark place to be consumed. Therefore to place the wrapped food into a dark place would not have provided a patentable feature over the prior art.

12. **Claims 3 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dunn (US 5658530) in view of Mawatari et al. (US 5614568) and Bontinck et al. (US 4367312) as applied to claims 1-2, 4-5, 7-8 and 13-14 above, and in further view of Shimamune et al. (US 4882196).**

Dunn, Mawatari et al. and Bontinck et al. are taken as applied above. Mawatari et al. further teach sintering as a means for bonding the metal ions to the hydroxyapatite (Column 7, Lines 40-47). As a result the metal supported on the hydroxyapatite is strengthened and cannot be dissolved out by water-treatment. As discussed above, it would have been obvious to one having ordinary skill in the art to modify Dunn given the teachings of Mawatari et al. for the purpose of increasing the antibacterial activity to styrene resin containers, and would have increased the amount of the antibacterial metal applied to the containers of Dunn, thus further improving the antibacterial ability of the food package. In order to prevent the titanium of Dunn from dissolving out of the hydroxyapatite, Mawatari et al. teach calcining the metal to the hydroxyapatite (Column 7, Lines 40-47). Therefore modified Dunn teaches the process of applying heat for sintering the metal to the hydroxyapatite.

Nevertheless, Dunn is silent in teaching wherein the metal-modified apatite after production has undergone sintering at 580 to 660°C.

Shimamune et al. are taken as applied above, in paragraph 7. In summary, Shimamune et al. teach that the temperature at which the hydroxyapatite coating is sintered depends on the state and thickness of the coating of the hydroxyapatite. Since Shimamune et al. teach sintering between 300 to 900°C, it would have been obvious to lower or increase the calcinations (or sintering) temperature taught by Mawatari et al., depending on the thickness of the coating desired. Therefore, to specifically sinter the modified hydroxyapatite at a temperature of between 580°C and 660°C would not have provided a patentable feature over the prior art.

13. **Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dunn (US 5658530) in view of Mawatari et al. (US 5614568) and Bontinck et al. (US 4367312), as applied to claims 1-2, 4-5, 7-8 and 13-14 above, and in further view Shimamune et al. (US 4882196).**

The rejection in view of Shimamune et al. is taken for the reasons discussed above in paragraph 12.

14. **Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dunn (US 5658530) in view of Mawatari et al. (US 5614568), Bontinck et al. (US 4367312) and Okamoto (JP 2000-051041), as applied to claims 10-11 above, and in further view Shimamune et al. (US 4882196).**

The rejection in view of Shimamune et al. is taken for the reasons discussed above in paragraph 12.

15. Claims 1-2, 4-5, 7-8 and 13-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakurada (JP 11-343210) in view of Wakamura et al. (JP 2000-327315) and Dunn (US 5658530).

Sakurada teaches applying a photocatalytic metal such as TiO_2 (Paragraph 0008) and an adsorption ingredient such as hydroxyapatite (Paragraph 0014) to paper, cloth and plastic products that can be used for food packaging (See Abstract). As a result bacteria and viruses are adsorbed into the coating and sterilization is carried out by the photocatalytic action of the metal (See Abstract). As a further result of the invention of Sakurada the need to carefully clean and wash articles that need to be sterile can be aided by adding the coating of Sakurada: this would have prolonged the sterility of the article without increasing the burden to wash and clean the article. (See Paragraphs 0003-0004).

Sakurada is silent in teaching wherein the hydroxyapatite adsorbent is modified by the photocatalytic metal and wherein the container is placed in a dark place, at least temporarily, as recited in instant claims 1, 4 and 7. Regarding instant claim 7, Sakurada is further silent in teaching wherein the metal modified apatite is added to the surface of a food.

Wakamura et al. teach that titanium oxide has been well known to be an antimicrobial agent (Paragraph 0002). Wakamura et al. further teach that titanium oxide does not have the properties for adsorbing matter, such as microorganisms on its face and limited oxidative degradation of such microorganisms is achieved using titanium oxide, alone (Paragraph 0002). Wakamura et al. teach that titanium oxide films have limited oxidative degradation function when used on its own and calcium phosphate compounds such as hydroxyapatite tends to lose its adsorption power when adsorption equilibrium is reached (Paragraph 0006). The invention of Wakamura et al. teach a combination of the photocatalyst activity of titanium with the adsorption activity of hydroxyapatite that maintains the adsorption power of the calcium phosphate while maintaining the oxidative disassembling properties of the photocatalyst (Paragraph 0002; Paragraph 0006; Paragraph 0007). Wakamura et al. further teach that calcium hydroxyapatite has been well known to adsorb organic substances (Paragraph 0003). To the ordinarily skilled artisan, it would have been obvious that as result of the adsorption properties hydroxyapatite would have enabled the removal of microbes from the surface of a material. By coprecipitation of the metallic oxide with the hydroxyapatite, Wakamura et al. teach replacing part of Ca with Ti (Paragraph 0010 and Example). Wakamura et al. further teach wherein the metal modified hydroxyapatite can be applied to several "configurations" such as a sheet, a film, a plate, a

particle and a tablet (Paragraph 0017). Wakamura et al. teach that the sheet or film can be used to cover one or both sides of a base material (Paragraph 0017).

Dunn is relied on to teach antibacterial packaging using photocatalytic titanium for food packages and to the surface of food products, as cited above in paragraph 5. Dunn further teaches that such packaged foods have been known to be placed in refrigerators for storage (Column 1, Lines 22-28). Dunn further teaches the inner surface of the container comprising the antibacterial titanium photocatalyst (Column 11, Line 58 to Column 12, Line 30).

Given the teachings of Wakamura et al. it would have been obvious to bond the titanium with the hydroxyapatite of Sakurada, since Wakamura et al. teach that on their own the antibacterial ability of the photocatalytic titanium is limited and the adsorptive ability of the hydroxyapatite diminishes when the adsorption equilibrium is reached. Such a modification would have provided the extended antimicrobial action that was desired by Sakurada so as to lower the burden on the consumer to clean and wash such articles.

Regarding placing the food in a container or wrapper, Sakurada teaches wherein the paper or plastic articles can be used for food packaging. Therefore it would have been obvious to one having ordinary skill in the art to place food in a plastic article of Sakurada or wrap food in the paper wrapper of Sakurada.

Further regarding instant claims 13 and 14, the plastic products of Sakurada are used as food packaging and are further coated with the hydroxyapatite and metal photocatalyst. Therefore, Sakurada teaches adding metal-modified apatite to the material with which the food container is made. Dunn teaches applying the photocatalyst to the inner surface of the container for the purpose of providing antibacterial activity to the surfaces confining the food product. As a result, any microbial growth inside the container would have been killed, thus spreading the growth of the microorganisms to the food product. Therefore, it would have been obvious to one having ordinary skill in the art to coat the inner surface of the container with the metal modified apatite for the purpose of preventing the spreading of microbial growth from the inner surface of the container to the food product. Additionally, bacterial and microorganisms have been well known to one having ordinary skill in the art to grow within the confines of food containers.

Regarding placing the food in a dark place at least temporarily, food products have been well known to the ordinarily skilled artisan to be kept in storage such as cabinets and refrigerators which are dark places. Furthermore, food products that require protection against bacteria have also been well known to be kept in cold storage such as refrigerators. Even further still, Dunn, on Column 1, Lines 22-28, teaches that food products requiring photocatalytic preservation have been well known to be stored in dark storage such as refrigeration. Therefore to place the food container in a dark place at least temporarily has been a well established means for storing a

perishable food product until consumption, and would not have provided a patentable feature over the prior art.

Further regarding instant claim 7, Dunn teaches deactivation of the contaminants as the surface of the food product (Column 6, Lines 35-65). Dunn teaches that as a result improved organism deactivation within one millimeter of the surface of the food product can be achieved (Column 6, Lines 24-34). Additionally, it would have been obvious to one having ordinary skill in the art that food products such as meats have been well know to grow bacteria on the food surface prior to packaging. This provides motivation to the ordinarily skilled artisan that a need exists to provide the same prolonged antibacterial activity at the surface of the food product. Given these teachings, it would have been obvious to one having ordinary skill in the art to apply the coating of Sakurada to the surface of the food product for the purpose of providing prolonged antibacterial activity to meat products that have a tendency to grow microorganisms at the surface.

16. Claims 10-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakurada (JP 11-343210) in view of Wakamura et al. (JP 2000-327315) and Dunn (US 5658530), as applied to claims 1-2 4-5 and 7-8 above, and in further view of Okamoto (JP 2000-051041).

Sakurada, Wakamura et al. and Dunn are taken as applied above. Sakurada is silent in teaching tableware.

Okamoto teaches tableware, which is similar to kitchenware, such as a drinking cup that comprises a photocatalyst for the purpose of removing odor and dirt from the inner portions of the tableware. Thus, Okamoto teaches providing similar photocatalytic activity to the surfaces of tableware for the purpose of preventing dirt and odors that collect on the inner surface from affecting the taste of the food.

Given these teachings, it would have been obvious to one having ordinary skill in the art to apply the coating of modified Sakurada to other items such as tableware. Since the coating of modified Sakurada can be applied as a coating on paper, plastic and cloth products, one would have had a reasonable expectation of success in applying the coating of modified Sakurada to cups, for example. Such a modification, as taught by Okomoto, would have prevented dirt and odor within the drinking cup from imparting an undesirable taste to the food product.

Regarding placing the tableware in a dark place, although silent in teaching this limitation, it would have been obvious that the tableware such as cups and forks and spoons have been well known to be placed in cabinets and drawers which do not allow light. When used the tableware is removed from the storage cabinet or drawer and exposed to light. Therefore, to place the tableware into a dark place would not have provided a patentable feature over the prior art.

17. Claims 3, 6 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakurada (JP 11-343210) in view of Wakamura et al. (JP 2000-327315) and Dunn (US 5658530), as applied to claims 1-2, 4-5,7-8 and 13-14 above, and in further view of Shimamune et al. (US 4882196).

Sakurada, Wakamura et al. and Dunn are taken as applied above. Wakamura et al. further teach after coprecipitation heat-treating at about 500°C for the purpose of forming the crystallized structure of the titanium oxide for the purpose of exhibiting the photocatalytic activity (Paragraph 0017).

Sakurada is silent in teaching sintering at 580 to 660°C.

Shimamune et al. is taken as applied above in paragraph 7.

In summary, Wakamura et al. teach heating at about 500°C while Shimamune et al. teach that the temperature can be varied depending on the thickness of the calcium phosphate compound. Therefore, depending on the thickness of the coating applied, as taught by Wakamura et al., it would have been obvious to one having ordinary skill in the art to raise the sintering temperature for the purpose of ensuring the strength of lamination. Furthermore, in applying such a film to the food package of Sakurada, it would have been obvious to ensure that the anti-microbial film has high strength and affinity to the substrate to which it was applied. Additionally, applying a thicker coating of the film of Wakamura et al. to the substrate of Sakurada would have required higher sintering temperatures and thus, to sinter between 580 to 660°C would not have provided a patentable feature over the prior art.

18. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sakurada (JP 11-343210) in view of Wakamura et al. (JP 2000-327315) and Dunn (US 5658530) and Okamoto (JP 2000-051041), as applied to claims 10-11, above, and in further view of Shimamune et al. (US 4882196).

Sakurada, Wakamura et al., Dunn and Okamoto are taken as applied above. Wakamura et al. further teach after coprecipitation heat-treating at about 500°C for the purpose of forming the crystallized structure of the titanium oxide for the purpose of exhibiting the photocatalytic activity (Paragraph 0017).

Sakurada is silent in teaching sintering at 580 to 660°C.

Shimamune et al. is taken as applied above in paragraph 8.

In summary, Wakamura et al. teach heating at about 500°C while Shimamune et al. teach that the temperature can be varied depending on the thickness of the calcium phosphate compound. Therefore, depending on the thickness of the coating applied, as taught by Wakamura et al., it would have been obvious to one having ordinary skill in the art to raise the sintering temperature for the purpose of ensuring the strength of lamination. Furthermore, in

applying such a film to the food package of Sakurada, it would have been obvious to ensure that the anti-microbial film has high strength and affinity to the substrate to which it was applied. Additionally, applying a thicker coating of the film of Wakamura et al. to the substrate of Sakurada would have required higher sintering temperatures and thus, to sinter between 580 to 660°C would not have provided a patentable feature over the prior art.

Conclusion

19. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. **US 5948458** discloses calcium hydroxyapatite added into food packages for preventing the spoilage of the food product. **US 6013275** discloses antibacterial compositions and laminates made therefrom. The compositions can be applied to plastics, films, and sheets. **US 5755969** discloses removing viruses in food fermentation processes using hydroxyapatite. **US 6013275** teaches titanium oxide particles as antimicrobial agents in films and sheets. **US 20030224032** teaches food packaging wherein the substrate can be a combination of titanium and hydroxyapatite. **US 4409251** teaches using titanium dioxide as a filler and preventing microbial growth on the food and food casing. **US 5066701** teaches metals in combination with hydroxyapatite for increased stability of the polymer compositions. **US 5472734** teaches cans for food and beverages that are made with a coating of hydroxyapatite. **US 5549919** teaches that iron has a deoxidizing ability and teaches applying iron to the food for preserving the food. **US 5573797** teaches adding metals for adjusting the pH to prevent microbial formation on the surface of the food. **JP 11-092637** discloses films comprising hydroxyapatite used for food packaging. **JP 03-008448** teaches photocatalytic coatings using titania applied to a substrate of a metallic conductor.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Viren Thakur whose telephone number is (571)-272-6694. The examiner can normally be reached on Monday through Friday from 8:00 am - 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Milton Cano can be reached on (571)272-1398. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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